

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

DIAMONDOP, LLC

Plaintiff,

v.

DELTA FAUCET COMPANY and
MASCO CORPORATION OF INDIANA
d/b/a DELTA FAUCET COMPANY
d/b/a BRIZO,

Defendants.

Civil Action No. 2:15-cv-1231-JRG

JURY TRIAL DEMANDED

**DEFENDANTS DELTA FAUCET COMPANY AND
MASCO CORPORATION OF INDIANA d/b/a DELTA FAUCET
COMPANY d/b/a BRIZO'S RESPONSE IN OPPOSITION TO
PLAINTIFF'S OPENING CLAIM CONSTRUCTION BRIEF**

TABLE OF CONTENTS

I. INTRODUCTION 1

II. OVERVIEW OF THE PATENTS IN SUIT 1

III. CONSTRUCTIONS FOR DISPUTED CLAIM TERMS..... 2

 A. “a percentage of sp³ carbon-carbon bonds in the layer increases as a layer
 thickness decreases” 3

 B. “single peak Raman” 15

 C. “a glass substrate” 18

 D. “subplantation” 26

 E. “hydrogenated carbon” 28

IV. CONCLUSION 30

INDEX OF AUTHORITIES

Cases

Phillips v. AWH, 414 F.3d 1303 (Fed. Cir. 2005)..... 1

I. INTRODUCTION

Plaintiff DiamondOP LLC's ("Plaintiff" or "DiamondOp") primary construction on all disputed claim terms is the plain and ordinary meaning. To advocate for the plain and ordinary meaning one must embrace the intrinsic evidence. *See generally, Phillips v. AWH*, 414 F.3d 1303 (Fed. Cir. 2005). Plaintiff, however, bases its construction for the plain and ordinary meaning and its alternate constructions on multiple pieces of extrinsic evidence, including through the declaration of its expert who in turn relies on the same extrinsic evidence.¹ Dkt. No. 43-1, p. 1-25

As this court knows from its experience in Markman proceedings, it's a Defendant not Plaintiff that often reverts to extrinsic evidence. Here, Plaintiff relies on the extrinsic evidence and ignores the fundamental inquiry on what the Applicants state is the invention. Plaintiff's attempt to rewrite the claims should give the Court pause.

II. OVERVIEW OF THE PATENTS IN SUIT

U.S. Patent No. 6,537,668 ("the '668 patent"), entitled "Recording Media Having Protective Overcoats of Highly Tetrahedral Amorphous Carbon and Methods for Their Production," and U.S. Patent No. 7,402,350 ("the '350 patent"), entitled "Highly Tetrahedral Amorphous Carbon Coatings and Systems and Methods for their Production," have a common specification. The specification describes the invention with a degree of certainty not found in Plaintiff's Opening Claim Construction Brief ("Plaintiff's Brief") or Tutorial. Defendants Delta Faucet Company and Masco Corporation of Indiana d/b/a Delta Faucet Company d/b/a Brizo's ("Defendants" or "Delta") Technology Tutorial, attached at Exhibit A, provides a well-grounded

¹ Compare Plaintiff's and Defendants' positions concerning reliance on extrinsic evidence.

review of the invention. A few excerpts from the Defendants tutorial are worthy of note and are as follows:

1. Field of the Invention

The present invention relates generally to thin films and methods for their deposition, and more particularly, provides diamond-like films, plasma beam deposition systems, and methods useful for production of diamond-like protective overcoats on magnetic recording media and other industrial applications.

Exhibit A, p. 3.

* * *

For these reasons, it would be beneficial to provide improved magnetic protective overcoats with improved read/write head frictional and glide characteristics (generally called stiction) for recording media.

Exhibit A, p. 4.

* * *

It would also be desirable to provide improved diamond-like carbon materials and methods for their deposition. It would be particularly desirable if such materials and methods could be utilized for practical rigid magnetic recording media with reduced spacing between the read/write head and the magnetic recording layer, ideally by providing a flatter, smoother, and thinner protective coating which maintained or even enhanced the durability of the total recording media structure.

Exhibit A, p. 4.

In sum, as noted above and in more detail in Defendants' Tutorial, the invention is a thin, ultrasmooth, protective layer/film having the characteristics of durability and low stiction (the force required to cause one body in contact with another to begin to move), the thin film/layer, whether measured as depth from the surface (deeper = thicker) or as one film compared to another film, has a higher sp³ content than a thicker film. Exhibit A, p. 18.

III. CONSTRUCTIONS FOR DISPUTED CLAIM TERMS

For ease of use, Defendants' response to Plaintiff's Brief is laid out as follows: Defendants' Section A corresponds to Plaintiff's Section A; Defendants' Section B corresponds

to Plaintiff's Section; Defendants' Section C corresponds to Plaintiff's Section E; Defendants' Section D correspond to Plaintiff's Sections D and F; and Defendants' Section E corresponds to Plaintiff's Sections C and G.

A. “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases”

This disputed claim term is found in asserted claims 1, 21, and 23-24 of the '668 Patent. Plaintiff begins its analysis by stating that “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” has “a plain and ordinary meaning using plain English and to a person of ordinary skill in the art.” Dkt. 50, page 5 of 34. In analyzing the claim term at issue, one should review it in the context of the asserted claims in which it is found. Independent claim 1 is an appropriate exemplar and is as follows:

1. An article comprising: a substrate; and a layer disposed over the substrate, the layer comprising a highly tetrahedral amorphous carbon having more than about 15% sp^3 carbon-carbon bonds and a single peak Raman spectrum, the layer further comprising at least one of hydrogen and nitrogen; wherein a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases.

Dkt. No. 50-4, p. 24 of 25, Col. 20, lines 51-59.

In the context of asserted claim 1, how does “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” for a given article? The claim term is not amenable to “a plain and ordinary meaning using plain English,” as asserted by Plaintiff. Therefore, one must look to the specification for guidance and the following excerpts are instructive:

EXPERIMENTAL

Films were deposited on aluminum substrates over a magnetic layer using opposed plasma beam sources and acetylene plasmas. The deposition conditions are summarized in Table 1. These conditions gave a highly ionized plasma and an ion beam energy of about 120 eV/C ion within a well-defined energy window.

TABLE I

Item	A-side	B-side	Condition
rf-input power	250 W	250 W	Phase-matched
rf-reflected power	5 ± 1 W	7 ± 1 W	Stable during deposition
Inner Coil Current	7.0 Å	7.0 Å	
Outer Coil Current	-0.5 Å	-0.5 Å	Reverse Polarity
Gas-flow rate	18 sccm	18 sccm	Plasma ignited at 43 sccm with a burst of N ₂ gas
Dep-Rate	8–9 Å/s	8–9 Å/s	Deposition time varied from 10–30 s

The acetylene gas flow rate was pre-set (by an electronic controller) to promote diamond-like bonding in the ta-C:H carbon films, rather than optimizing the deposition rate. Gas flow rates are in standard cubic centimeters per second (sccm). The matching-network circuit passive elements were pre-tuned so as to minimize the ratio of $P_{\text{ref}}/P_{\text{in}}$ (power reflected over power input) at the above-mentioned acetylene flow rate.

Dkt. No. 50-4, p. 23 of 25, Col. 18, line 9-44 (emphasis added).

* * *

Table II summarizes the variation of physical properties of the films as a function of thickness. The average ion energy per carbon ion was uniformly maintained at about 100 eV. The spatial homogeneity of the films is gauged in both the radial as well as angular positions. Generally, G-peak and D-peak are V-peak positions in Raman spectroscopy, while the associated .DELTA. values describe peak widths. Selket voltage is the output voltage of a light sensor for abrasive wear test equipment manufactured by Selket Co. The higher the output voltage, the more serious the wear.

TABLE II

Item	thickness (Å) ± 10	Selket Voltage (mV)	G-peak ± 5 cm ⁻¹	G-peak $\Delta \pm 5$ cm ⁻¹	RMS* R _a (Angs)	Raman I _d /I _g	Plasmon Peak (eV)
Cell 1	40	3	1494	150	3	0.24	31.4
Cell 2	50	2	1498	152	4	0.48	30.0
Cell 3	70	5	1508	138	6	0.5	29.5
Cell 4	80	7	1507	137	6	0.6	29.8
Cell 5	100	6	1509	130	9	0.7	29.7
Cell 6	200	7	1509	130	8	1.0	25.5

One noteworthy observation from the Raman spectra is the increase in both the position of the G-peak as well as the I_d/I_g ratio (the area ratio of the D and G

peaks) with increasing film thickness. This shows that the percentage of C--C sp^3 content in the bulk of the films increases with decreasing thickness. D-peak bandwidth also increases with decreasing film thickness within the range monitored. The bandwidth of the D-peak in the optimized films is above 150 cm^{-1} , indicating very low levels (or absence) of graphitic phase clustering within the diamond-like carbon amorphous matrix. This result is consistent with the relatively high Plasmon-peak measured from the electron-energy-loss-spectroscopy (EELS). Plasmon peak is the energy of a type of excitation called a plasmon. It is a quantum of charged particle cloud vibration. The energy value is directly related to the charged particle (e.g., electron) density.

The Plasmon-peak E_p is representative of the density of the films. Thus, taking the E_p of diamond to be 34 eV, it is estimated that the most-diamond-like ta-C:H films have above 80% C--C sp^3 bonding (this is independent of whether there is long range order or not).

Dkt. No. 50-4, p. 23 of 25, Col. 18, line 58-Col. 19, line 33 (emphasis added).

From the specification, it is clear that contra to the unsupported position taken by Plaintiff at Dkt. No. 50, p. 6 of 34 of its Brief, the Experiment noted at Col. 18, line 58-Col. 19, line 33 of the '668 patent, does not chronicle the formation of a "single layer" on a single substrate. Rather, as clearly and unmistakably noted in the Experimental section, Dkt. No. 50-4, p. 24 of 25, Col. 19, lines 1-10, there are six discrete cells identified in Table II, cells 1 through 6, each cell having the characteristics and properties noted. The suggestion by Plaintiff that Table II shows in essence a "birthday cake," with the multiple layers being dissected from a single layer deposited on a single substrate, is false and misleading. More particularly, in the Experiment as the Applicants noted, "[f]ilms were deposited on aluminum substrates over a magnetic layer using opposed plasma beam sources and acetylene plasmas." *Id.* at p. 23 of 25, Col. 12-14 (emphasis added). In addition, Table I reflects that the only condition that changes is the deposition time, "deposition time varied from 10-30s," which correlates as noted in Table I to the deposition rate, $8\text{-}9\text{\AA}/\text{s}$, for deposition of a film onto a given aluminum substrate. *Id.* at p. 23 of 25, Col. 18, lines 19-33. In addition, it is noted that "Table II summarizes the variation of

physical properties of the films as a function of thickness.” *Id.* at 24 of 25, Col. 18, lines 58-29

(emphasis added). Finally, on the description of what Table II shows, the Applicants state:

One noteworthy observation from the Raman spectra is the increase in both the position of the G-peak as well as the I_D/I_G ratio (the area ratio of the D and G peaks) with increasing film thickness. This shows that the percentage of C--C sp^3 content in the bulk of the films increases with decreasing thickness. D-peak bandwidth also increases with decreasing film thickness within the range monitored. The bandwidth of the D-peak in the optimized films is above 150 cm^{-1} , indicating very low levels (or absence) of graphitic phase clustering within the diamond-like carbon amorphous matrix. This result is consistent with the relatively high Plasmon-peak measured from the electron-energy-loss-spectroscopy (EELS). Plasmon peak is the energy of a type of excitation called a plasmon. It is a quantum of charged particle cloud vibration. The energy value is directly related to the charged particle (e.g., electron) density.

Id. at p. 24 of 25, Col. 18, lines 13-28 (emphasis added).

With the foregoing from the specification noted for the record, the prosecution history is the next source of intrinsic evidence that supports that each cell in Table II represents a substrate on which a layer is deposited and then analyzed. As noted in the prosecution history for the ‘668 patent, on August 22, 2001, the Examiner issued an obviousness rejection over the doctoral dissertation by Veerasamy rejecting all claims under 35 U.S.C. § 103 as unpatentable over U.S. Patent No. 6,194,472 to Hayashi. Dkt. No. 51-1, p. 76-77 of 123. In response, the Applicants amended claim 38, 62, and 63 to add the limitation “wherein a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases.” *Id.* at p. 61-64 of 123. The Applicants remarks concerning the amendment are as follows:

In fact, a close examination of this reference reveals that sp^2 carbon-carbon bonding, i.e. graphite, increases with decreasing layer thickness. Veerasamy Dissertation, pages 115-117, Section 4.3.3 Thickness Dependence of sp^2 -Bonded Fraction. Specifically, Veerasamy investigates the relationship between sp^2 bonding as a function of thickness of the tetrahedral amorphous carbon and concludes that,

there is also a noticeable increase in the relative intensity of the $1s \rightarrow \pi^*$ peak with decreasing ta-C film thickness from 200 nm (2000 Å). This

indicates an enhancement in sp^2 contribution in the thinner films ... This imply that the sp^2 fraction within the bulk of the thinnest film is highest.

Id. Hence, Veerasamy effectively teaches away from Applicants invention of a tetrahedral amorphous carbon layer having sp^3 carbon-carbon bonding which increases with decreasing layer thickness, as the Veerasamy Dissertation acknowledges that its thinnest layers promote the highest formation of sp^2 bonding.

Id. at p. 65-66 of 123.

To put the remarks in appropriate context, the full excerpt from the Veerasamy Dissertation is as follows:

4.3.3 Thickness dependence of sp^2 -bonded fraction

In this section the existence of a surface-layer rich in sp^2 -bonded C as proposed by McKenzie [53] is investigated. In parallel, the intrinsic structure of ta-C at different growth stages is probed in order to shed more light on the growth mechanism. Thus ta-C films of varying thicknesses, ranging from 10 to 200 nm, were grown on mica substrates under the same filter fields and arc parameters described before. EELS measurements were performed and the respective C-K edge of three ta-C films of various thicknesses are shown in Fig. (4.15) together with that of an a-C film grown from graphite sputtering. In order to easily gauge the relative heights of the pre-edge peaks, the spectra shown have been normalized to the intensity of the 200 nm film spectrum at 290 eV. One main observation is that the shape and relative intensity of the $1s \rightarrow \pi^*$ pre-edge peak of all the ta-C films differs from that of evaporated a-C. Also the peaks are shifted upward in energy by about 1 eV in the case of ta-C. This suggests that the bandgap of ta-C is at least 1 eV above that of the a-C. Since the gap-closing mechanism is directly related to the size of sp^2 clusters and interactions (143), it can be inferred here that the sp^2 clusters are relatively smaller and more isolated in ta-C than in a-C.

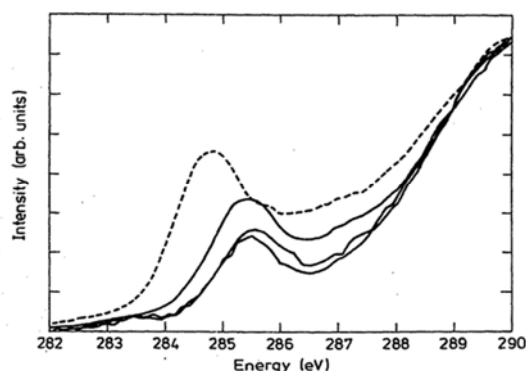


Figure 4.15: EELS pre-edge peaks for ta-C films of varying thickness deposited on Si (solid lines). A spectrum (dotted lines) is taken from evaporated a-C is

included for comparison. The spectra with the lowest to highest pre-edge peak intensity correspond to ta-C films which are 200 nm, 30 nm, 10 nm thick respectively.

In Fig. (4.15) there is also a noticeable increase in in the relative intensity of the $1s \rightarrow \pi^*$ peak with decreasing ta-C film thickness from 200nm down to 10 nm. This indicates an enhancement in sp^2 contribution in the thinner films. The integrated area of the $1s \rightarrow \pi^*$ provides an estimate of the relative proportion of sp^2 -bonded fraction using the 200 nm film as the datum. The slight relative increase in the 30 nm film is consistent with the presence of an sp^2 -bonded surface layer having a maximum thickness of 9.0 nm. However in the case of the 10 nm film the presence of a similar surface layer alone cannot account for the observed increase in sp^2 bonding. This imply that the sp^2 fraction within the bulk of the thinnest film is highest. This is also consistent with the slightly lower position in energy of its $1s \rightarrow \pi^*$ peak compared to the thicker films.

It has been proposed that the tetrahedral structure of ta-C (143) is favoured by the subplantation of C ions resulting in a localized densification process. Assuming such a densification process, the growth mechanism can then be seen as consisting of the following states.

- The initial formation of a layer predominantly rich in sp^2 sites.
- This layer which acts as a precursor to the formation of ta-C is likely to be dominated by disordered graphitic-like bonded C atoms. Its subsequent bombardment by incoming C ions give rise to localized compression and hence a transition to metastable sp^3 phase.
- This suggests that the top-most film layer may be rich in sp^2 hybridized C atoms.

It is also interesting to note that the compressive stress is also higher in the 30 nm thick film compared to the thinnest one. In chapter 6 it will be shown how the hydrostatic component of a compressive stress can stabilize a denser metastable form of a-C.

Dkt. No. 51-3, p. 3-5 of 20 (emphasis added).

As noted in the ‘668 Patent specification and the Veerasamy Dissertation, the films/layers are deposited on multiple substrates, in the ‘668 patent specification on aluminum substrates and in the Veerasamy Dissertation on mica substrates. Each cell was then analyzed using Raman and EELS to determine the physical characteristics noted. For the Plaintiff and its paid “expert” to state otherwise in view of the facts from the intrinsic record, should cause this Court pause.

Plaintiff continues its mischaracterizations concerning its “single layer” theory by stating “[h]ere, the Veerasamy Dissertation is referring to an ‘initial formation’ layer rich in sp^2 via a densification process. This ‘initial formation’ layer is covered by one or more successive layers culminating in a ‘top-most layer.’” Plaintiff’s Brief, Dkt. No. 50 at p. 8 of 34. This characterization is false. As noted in the Veerasamy Dissertation referenced above, there is initial formation of a layer predominantly rich in sp^2 sites, which acts as a precursor to ta-C formation by densification. Dkt. No. 51-3, p. 3-5 of 20. The reference, however, does not describe formation of a “birthday cake,” as Plaintiff argues.

Proceeding now to the analysis of the respective parties’ positions, it is clear that Plaintiff’s entire position on claim construction rests on the theory that there are multiple layers applied to a single substrate. Specifically, Plaintiff states that “[i]n Table II, ‘Cell 1’ is closest to the substrate and has the lowest Id/Ig ratio, which means it has the highest percentage of C-C sp^3 bonds. To one of ordinary skill in the art, this indicates that when a DLC layer is analyzed at different levels within that layer, the percentage of sp^3 bonds is found to increase as the layer is analyzed closer to the substrate.” Dkt. No. 50, p. 6 of 34 (emphasis added). However, having shown that this position is utterly false, based on the ‘668 specification and the Veerasamy Dissertation, one must look to the intrinsic evidence and the principles of claim construction to determine what the disputed claim terms means. In this regard, Defendants’ expert, Dr. Thomas Schuelke, relies solely on the intrinsic evidence of record, noting that at the time of the invention of the ‘668 Patent, one would understand that the ‘668 Patent uses “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” to cover something other than the ordinary and customary meaning of the term. Dkt. No. 43-3, p. 25 of 32. More particularly, in reviewing the term, it is not clear how “a layer thickness decreases” while considering any

given article. *Id.* at p. 25-26 of 32. This claim term is more understandable if it is looked at as a comparison of two or more articles having differing thicknesses, rather than with respect to a single article. *Id.* at p. 25-26 of 32.

A person of ordinary skill in the art would understand, upon reviewing the term “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” on its face, in the context of the claims in which it is used and in trying to put meaning to the words, without reference to the specification or the file history, the term to refer to a gradient or change in the percentage of sp^3 carbon-carbon bonds going from the substrate to the surface. *Id.* at p. 26 of 32. This interpretation is aided if one reads “thickness” to mean depth, that is “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer depth decreases.” *Id.* at p. 26 of 32.

From the intrinsic record, a person of ordinary skill in the art would understand in reviewing the ‘668 Patent specification, as follows:

The carbon protective coatings of the present invention will often be hydrogenated, generally providing a significantly higher percentage of carbon-carbon sp^3 bonds than known hydrogenated amorphous diamond-like carbon coatings having similar compositions, and may optionally be nitrogenated.

Dkt. No. 50-4, p. 16 of 25, ‘668 Patent, Col. 3, lines 41-46

The ions impact with an energy which promotes formation of sp^3 carbon-carbon bonds. Advantageously, such a method can form a highly tetrahedral amorphous carbon protective layer, generally having more than about 15% sp^3 carbon-carbon bonds. Generally, the impact energy of the energetic carbon ions is within a pre-determined range to promote formation of the desired lattice structure, the bonds apparently being formed at least in part by subplantation. Preferably, each carbon ion impacts with an energy of between about 100 and 120 eV. In many embodiments, the resulting highly tetrahedral amorphous carbon protective layer includes more than about 35% sp^3 carbon-carbon bonds, with particularly preferred methods producing more than about 70% sp^3 carbon-carbon bonds.

Id. at p. 16 of 25, Col. 3, line 64-Col. 4, line 11.

In another aspect, the present invention provides a diamond-like material comprising carbon in the range between about 72 and 92 atomic percent, and

hydrogen in the range between about 8 and 18 atomic percent. The material is amorphous, and between about 15 and 85 percent of carbon-carbon bonds are sp^3 sp^3 bonds. Generally, sp^3 bond formation will be promoted with subplantation using ion-beam deposition from a plasma beam source, so that the number of such bonds will be higher than known materials having similar compositions. Hence, the highly tetrahedral amorphous carbon and hydrogenated carbon of the present invention will have fewer polymer-like hydrogen chains, and will generally exhibit enhanced thermal and mechanical stability.

Id. at p. 17 of 25, Col. 5, lines 6-18

TABLE II

Item	thickness (Å) ± 10	Selket Voltage (mV)	G-peak ± 5 cm^{-1}	G-peak Δ ± 5 cm^{-1}	RMS* R_a (Angs)	Raman I_d/I_g	Plasmon Peak (eV)
Cell 1	40	3	1494	150	3	0.24	31.4
Cell 2	50	2	1498	152	4	0.48	30.0
Cell 3	70	5	1508	138	6	0.5	29.5
Cell 4	80	7	1507	137	6	0.6	29.8
Cell 5	100	6	1509	130	9	0.7	29.7
Cell 6	200	7	1509	130	8	1.0	25.5

Id. at p. 24 of 25, Col. 19, line 1

One noteworthy observation from the Raman spectra is the increase in both the position of the G-peak as well as the I_d/I_g ratio (the area ratio of the D and G peaks) with increasing film thickness. This shows that the percentage of C-C sp^3 content in the bulk of the films increases with decreasing thickness. D-peak bandwidth also increases with decreasing film thickness within the range monitored. The bandwidth of the D-peak in the optimized films is above 150 cm^{-1} , indicating very low levels (or absence) of graphitic phase clustering within the diamond-like carbon amorphous matrix. This result is consistent with the relatively high Plasmon-peak measured from the electron-energy-loss-spectroscopy (EELS). Plasmon peak is the energy of a type of excitation called a plasmon. It is a quantum of charged particle cloud vibration. The energy value is directly related to the charged particle (e.g., electron) density.

The Plasmon-peak E_p is representative of the density of the films. Thus, taking the E_p of diamond to be 34 eV, it is estimated that the most-diamond-like ta-C:H films have above 80% C-C sp^3 bonding (this is independent of whether there is long range order or not).

Id. at p. 24 of 25, Col. 19, line 13-33

A person of ordinary skill in the art would understand from the '668 Patent that the claim term "a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases" is derived from the discussion of data in Table II, and in further analyzing Col. 19,

lines 13-33, as quoted above. Dkt. No. 43-3, p. 28 of 32. If one accepts the data as-is, it appears to reflect a comparison of the I_d/I_g ratio of six test film “cells” of varying thicknesses. *Id.* at p. 28 of 32. The highest sp^3 content is reflected in the thinnest film of Cell 1. *Id.* at p. 28 of 32. In Table II, six cells deposited on six aluminum substrates were analyzed and as noted the I_d/I_g ratio reflects that the thinnest film has the highest sp^3 content. *Id.* at 28 of 32. This comports with what the Applicants state is the invention:

One noteworthy observation from the Raman spectra is the increase in both the position of the G-peak as well as the I_d/I_g ratio (the area ratio of the D and G peaks) with increasing film thickness. This shows that the percentage of C--C sp^3 content in the bulk of the films increases with decreasing thickness. D-peak bandwidth also increases with decreasing film thickness within the range monitored. The bandwidth of the D-peak in the optimized films is above 150 cm^{-1} , indicating very low levels (or absence) of graphitic phase clustering within the diamond-like carbon amorphous matrix. This result is consistent with the relatively high Plasmon-peak measured from the electron-energy-loss-spectroscopy (EELS). Plasmon peak is the energy of a type of excitation called a plasmon. It is a quantum of charged particle cloud vibration. The energy value is directly related to the charged particle (e.g., electron) density.

Dkt. No. 50-4, p. 24 of 25, ‘668 Patent, Col. 19, lines 13-28 (emphasis added).

As one goes respectively to thicker cells, the sp^3 content is said to decrease, with the lowest sp^3 content being in the thickest cell of Cell 6. Dkt. No. 43-3, p. 28 of 32. The use of an I_d/I_g ratio further confirms that the percentage of carbon-carbon bonds are being evaluated and that the percentage of sp^3 carbon-carbon bonds is being described, measured, and reported in the Table. *Id.* at p. 28 of 32. One of ordinary skill in the art would further understand, however, that there is a distinction to be made between six thicknesses being compared to each other based on I_d/I_g ratios and the claim term where a single thickness is being described. *Id.* at p. 28 of 32.

A person of ordinary skill in the art would understand in reviewing the file history that there is support for two separate positions. *Id.* at p. 28 of 32. The first is that the comparison being made in Table II appears to more keenly support Defendants’ alternative position of “the

percentage of carbon-carbon bonds that are sp^3 carbon-carbon bonds in the layer increases as the layer thickness decreases when comparing at least two layers of different thicknesses,” rather than the Defendant’s first position of “the percentage of carbon-carbon bonds that are sp^3 carbon-carbon bonds in the layer increases from the substrate to the surface.” *Id.* at 29 of 32. More particularly, the file history includes the following references:

Claims 38-46, 48-59, and 61-63 were rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Doctoral Dissertation by Vijayen S. Veerasamy, Claim 38 was also rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,194,047 B1, issued to Hayashi. Such rejections are traversed in part and overcome in part as follows.

To more clearly claim the present invention, Applicants have amended claim 38 to recite an article comprising a substrate and a layer disposed over the substrate. The layer comprises a highly tetrahedral amorphous carbon having more than about 15% sp^3 carbon-carbon bonds and a single peak Raman spectrum, the layer further comprising at least one of hydrogen and nitrogen. In particular, claim 38 now recites that a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases. Support for this amendment can be found throughout the originally filed application, and particularly on page 31, line 15 through page 33, line 26; page 32, Table II. Such a material property is not shown or reasonably suggested in the cited art.

Dkt. No. 51-1, p. 35 of 123.

The Veerasamy dissertation does describe the use of compact filtered cathodic vacuum arc deposition systems for the growth of tetrahedral amorphous carbon films for semiconductor applications. Veerasamy Dissertation, page 1. However, this reference fails to describe or suggest a highly tetrahedral amorphous carbon layer having a percentage of sp^3 carbon-carbon bonds which increases with a decreasing layer thickness. In fact, a close examination of this reference reveals that sp^2 carbon-carbon bonding, i.e. graphite, increases with decreasing layer thickness. Veerasamy Dissertation, pages 115-117, Section 4.3.3 Thickness Dependence of sp^2 -Bonded Fraction. Specifically, Veerasamy investigates the relationship between sp^2 bonding as a function of thickness of the tetrahedral amorphous carbon and concludes that,

there is also a noticeable increase in the relative intensity of the $1s \rightarrow \pi^*$ peak with decreasing ta-C film thickness from 200 nm [2000 Å] down to 10 nm [100 Å]. This indicates an enhancement in sp^2 contribution in the thinner films ... This imply that the sp^2 fraction within the bulk of the thinnest film is highest.

Id. Hence, Veerasamy effectively teaches away from Applicants invention of a tetrahedral amorphous carbon layer having sp^3 carbon-carbon bonding which increases with decreasing layer thickness, as the Veerasamy Dissertation acknowledges that its thinnest layers promote the highest formation of sp^2 bonding. With respect to the Hayashi reference, Applicants fail to see even a remote teaching or suggestion for a highly tetrahedral amorphous carbon layer having more than about 15% sp^3 carbon-carbon bonds, much less a layer whose sp^3 carbon-carbon bonding increases with decreasing thickness layer. Applicants request, if the present rejection is maintained, that the Examiner show or explain where the cited references, or how knowledge of those skill in the art, teach or suggest the proposed limitation.

Id. at p. 36 of 123.

A person of ordinary skill in the art would understand in reviewing the claim term in the context of the asserted claims, in the context of the '668 Patent, and in view of the file history that an alternate construction, "the percentage of carbon-carbon bonds that are sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases when comparing at least two layers of different thicknesses" comports with the arguments made in the file history and by Table II. Dkt. No. 43-3, p. 30 of 32.

DiamondOP advocates for the plain and ordinary meaning, or alternatively a construction which it says is identical to the plain and ordinary meaning, that is opposite to that of the Defendant's first construction. That is, rather than referring to a gradient that increases from the substrate to the surface, DiamondOp is advocating a reverse gradient, increasing from the surface to the substrate. *Id.* at p. 30 of 32. DiamondOP's position however is contrary to the file history. *Id.* at p. 30 of 32. As discussed above, DiamondOP distinguished the Veerasamy Dissertation from the claimed invention, by characterizing the Veerasamy Dissertation as teaching higher sp^2 (lower sp^3) contributions in thinner films. *Id.* at p. 30 of 32. This discussion of DiamondOP's claimed invention is construed to refer to a gradient, i.e., where "decreasing layer thickness" means "decreasing depth." *Id.* at p. 30-31 of 32. In this light, it should be noted that the

Veerasamy Dissertation, on page 117, describes the growth mechanism for ta-C films. *Id.* at p. 31 of 32. Veerasamy states that the mechanism “suggests that the top-most film layer may be rich in sp^2 hybridized C atoms.” *Id.* at p. 31 of 32. The construction urged by DiamondOP is inconsistent with DiamondOP’s position distinguishing the Veerasamy Dissertation during prosecution. *Id.* at p. 31 of 32.

In sum, when looking at the claim language itself, a person of ordinary skill in the art at the time of the invention of the ‘668 patent would understand the claim term “percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” as meaning “the percentage of carbon-carbon bonds that are sp^3 carbon-carbon bonds in the layer increases from the substrate to the surface.” *Id.* at p. 31 of 32. It is also true that a person of ordinary skill in the art at the time of the invention of the ‘668 patent would, when looking at the specification and file history in addition to the claim language, understand the claim term “a percentage of sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases” as meaning “the percentage of carbon-carbon bonds that are sp^3 carbon-carbon bonds in the layer increases as a layer thickness decreases in comparing these two layers of different thicknesses.” *Id.* at p. 31 of 32.

B. “single peak Raman”

This claim term is found in asserted claims 1, 10, 12-13, 21, and 23 of the ‘668 Patent. Plaintiff aggregates four sets of terms in its discussion on single peak Raman. These are “single peak Raman spectrum,” “a carbon bonding pattern being free from a D-peak Raman spectrum,” “a carbon bonding pattern characterized by a single peak Raman spectrum” and “the single peak Raman spectrum is characterized by a generally smooth curve.” The parties agree that the

disputed terms take their plain and ordinary meaning. The core issue with Plaintiff's analysis is its attempt to restrict the plain and ordinary meaning.

Plaintiff, in no uncertain terms, admits as follows concerning its analysis of the claim terms at issue:

Secondly, when multiple peaks overlap and are close enough to combine, their superposition (e.g., sum) may not form a single peak. *Id.* The resulting spectrum may still show one or more visually apparent discrete peaks, or peaks with shoulders. *Id.* As noted in the '668 specification, "[i]n some instances, the generally smooth curve 202 may exhibit a localized secondary perturbation 206 that is offset from the smooth curve 202." '668/20:30-32. If the Raman spectrum data was deconvoluted as Delta proposes, then secondary perturbation 206 would be represented/identified as a distinct, separate peak, not a perturbation offset from smooth curve 202.

An exemplary Raman spectrum described in the '668 Patent (see, e.g., Figure 8) shows a typical Raman spectrum with a single apparent peak, and not a deconvoluted spectrum. *Id.* The specification describes that Figure 8 "includes a G-peak in the area of about 1518, and ha[s] a G width of approximately 175" that is "dominated by a single peak." '668 Patent, 20/24-33. This illustrates that a single Raman peak spectrum as viewed with the naked eye (e.g., as shown in Fig. 8), need not be further mathematically deconvoluted in order to show a single Raman peak. *Id.* In fact, if the spectrum was deconvoluted, it would necessarily have more than one peak, consistent with the peak data in Table II. *Id.* Thus Delta's construction is directly contradicted by the specification. *Id.*

Dkt. No. 50, p. 12-13 of 34 (emphasis added).

By definition, for there to be a generally "smooth curve" 204 (not 202), the raw data 200 from a Raman analysis needs to be "smoothed" through use of a mathematical model to arrive at the smooth curve 204. Therefore, the statement in Plaintiff's Brief that there is no mathematical manipulation of the data is wrong. *Id.* at p. 12 of 34.

Plaintiff notes that the touchstone for the plain and ordinary meaning is visualization. Dkt. No. 50, p. 12 of 34. If this is true then one cannot ignore the existence of a shoulder which, as agreed to by Plaintiff, notes the presence of a D Peak. *Id.* at 13 of 34. How can one of ordinary skill in the art say that the claim limitation "free from a D peak" is determined by mere

visualization of a mathematically smoothed curve, yet ignore the shoulder indicative of a D peak? This is illogical and wrong.

It is this kind of inconsistency that Plaintiff advocates in restricting the plain and ordinary meaning that concerns Defendants and should cause this Court pause in determining what the framework is for plain and ordinary meaning. If this Court restricts the plain and ordinary meaning as Plaintiff requests, then multiple other restrictions will need to be made. For example, if one relies on “visual inspection,” then one of ordinary skill in the art should, if the results on visual inspection require or suggest it, do more to determine infringement. Otherwise, one of ordinary skill in the art is not using the plain and ordinary meaning to apply the claim term to the purported infringing article.

Other examples of the issues presented by Plaintiff’s attempt to restrict one of ordinary skill in the art’s determination of the “plain and ordinary meaning” are reflected by the following:

TABLE II

Item	thickness (Å) ± 10	Selket Voltage (mV)	G-peak ± 5 cm ⁻¹	G-peak Δ ± 5 cm ⁻¹	RMS* R _g (Angs)	Raman I _D /I _G	Plasmon Peak (eV)
Cell 1	40	3	1494	150	3	0.24	31.4
Cell 2	50	2	1498	152	4	0.48	30.0
Cell 3	70	5	1508	138	6	0.5	29.5
Cell 4	80	7	1507	137	6	0.6	29.8
Cell 5	100	6	1509	130	9	0.7	29.7
Cell 6	200	7	1509	130	8	1.0	25.5

Id. The data in Table II describing the intensity of the G and D components, the I_D/I_G ratio, must come from a deconvolution, but still the specification describes the spectrum as having one peak because that is what one observes by visual inspection. *Id.* There is no discussion of a deconvoluted Raman spectrum in the patent or prosecution history that would lead a person of ordinary skill in the art to understand the phrase “single peak Raman spectrum” means “single peak deconvoluted Raman spectrum.” *Id.* For these same reasons, there is nothing that would lead a person of ordinary skill in the art to understand any of these phrases to require a deconvoluted Raman spectrum.

Dkt. No. 50, p. 17-18 of 34 (emphasis added).

Plaintiff fails to recognize, however, its admission that “data in Table II describing the intensity of the G and D components, the Id/Ig ratio, must come from a deconvolution, but still the specification describes the spectrum as having one peak because that is what one observes by visual inspection” presents a fundamental issue in its attempt to argue against deconvolution or, frankly, some other necessary determination that is driven by the results of a visual inspection.

In sum, “single peak Raman” takes its plain and ordinary meaning, which is determined by visualization on a case by case basis.

C. “a glass substrate”

This claim term is found in asserted claims 1, 18, 30, 34, and 38 of the ‘350 Patent. Of all of Plaintiff’s attempts to construe the claim terms at issue, its analysis on glass substrate is the most egregious in terms of the wholesale reliance on multiple pieces of extrinsic evidence, authored both before and after the critical date. The entirety of Plaintiff’s Brief on glass substrate is an attempt to arrive at a construction for glass substrate that not only captures glass, but multiple other materials, including, for example, wood, which is an amorphous (non-crystalline) solid.

Plaintiff’s attempt to expand the construction of glass to include multiple non-glass materials, also completely ignores the intrinsic evidence. As noted in the specification, the Applicants identified the following substrates:

Referring now to FIG. 1, a rigid magnetic recording disk 2 comprises a non-magnetic disk substrate 10, typically composed of an aluminum alloy, glass, ceramic, a glass-ceramic composite, carbon, carbon-ceramic composite, or the like.

Dkt. No. 50-4, p. 17 of 25, Col. 6, lines 60-64.

Applicants make a clear distinction between aluminum alloy, glass, ceramic, a glassy ceramic composite, carbon, carbon-ceramic composite and other substrates. The claim term chosen by the Applicants that appears in the asserted claims is “a glass substrate.” It is not an aluminum alloy, ceramic, glassy-ceramic composite, carbon, carbon-ceramic composite, or other substrate. To adopt Plaintiff’s construction position would be to capture these distinctly different substrates and to ignore the distinction made in the intrinsic evidence.

Defendants’ expert Dr. Thomas Schulke understands from a review of the specification that a distinction is being made as to the various types of substrates that are available and more particularly as to a “glass substrate,” that a distinction is made between glass, ceramic, and glass-ceramic composite. Therefore, in view of the specification, a person of ordinary skill in the art would come to a determination that the definition applicable at the time of filing the patents in suit, would most clearly align with the following definition:

a glass substrate is a substrate that has the random structure of the liquid from which it is derived by cooling below the freezing (solidification) point, without crystallization. Kittel, Charles. *Glasses. Introduction to Solid State Physics*. 7th ed. N.p.: John Wiley & Sons, 1996. 527-28. Print.

One of ordinary skill in the art would understand that from the most fundamental principles a glass, as identified in Defendants’ construction, has the random structure of the liquid from which it is derived by cooling below the freezing point, without crystallization. Dkt. No. 43-3, p. 17 of 32. This construction is based on the definition of “glass” set forth in Kittel, Charles. “Glasses.” *Introduction to Solid State Physics*. 7th ed. N.p.: John Wiley & Sons, 1996. 527-28. Print. *Id.* at p. 17 of 32.

DiamondOP’s construction that “a glass substrate” should be construed to mean “a substrate that is an amorphous (i.e., a noncrystalline) solid,” subsumes a wide variety of materials that are not glass, as would be understood by one of ordinary skill in the art. *Id.* at p.

17 of 32. For example, wood is a non-crystalline solid, but is not a glass. *Id.* at 17 of 32. DiamondOP's definition makes no distinction between glass and other materials recited as suitable substrates in the '350 Patent, as quoted above, such as glass-ceramics and carbon which may also be non-crystalline solids. *Id.* at p. 17 of 32.

Glasses are a subclass of non-crystalline solids – while all glasses are non-crystalline solids, not all non-crystalline solids are glasses. *Id.* at p. 17 of 32. By definition, in addition to being non-crystalline, glasses are identified by the process by which they are made, as by cooling from a melt into a non-crystalline or amorphous state. *Id.* at p. 17 of 32. As succinctly stated by Kittel (above), they are non-crystalline solids derived from cooling a liquid such that the random structure of the liquid is maintained. *Id.* at p. 17 of 32.

This understanding of “glass” is, in fact, supported by the extrinsic evidence cited by DiamondOP. For example, DiamondOP quotes three references, as follows:

Jiang, Z., & Zhang, Q. (2014). The structure of glass: A phase equilibrium diagram approach. *Progress in Materials Science*, 61, pp. 144-215. doi:10.1016/j.pmatsci.2013.12.001 (“The [ASTM] International defines glass as ‘an inorganic product of fusion which has cooled to a rigid condition without crystallising.’”).

How are glass, ceramics and glass-ceramics defined?, TWIGlobal at <http://www.twi-global.com/technical-knowledge/faqs/materialfaqs/faq-how-are-glass-ceramics-and-glass-ceramics-defined/> (“An ASTM definition of glass describes the inorganic, amorphous, product of a rapidly cooled melt.”)

Belle Dumé, Glass breakthrough. PhysicsWorld.com. <http://physicsworld.com/cws/article/news/2004/aug/11/glassbreakthrough>.

Id. at p. 18 of 32.

As reflected in these references, a “glass” is not simply a non-crystalline solid, but is a material defined by the process of cooling material from a liquid to a solid state. *Id.* at p. 18 of 32.

One of DiamondOP's additional references appears to be irrelevant to the definition of glass, cited as follows:

Lee, S. K., Lee, S. B., Park, S. Y., Yi, Y. S., & Ahn, C. W. (2009). Structure of Amorphous Aluminum Oxide. *Phys. Rev. Lett. Physical Review Letters*, 103(9). doi:10.1103/physrevlett.103.095501 (“As amorphous phases [of alumina] can be formed as thin films through vapor deposition, study of amorphous Al₂O₃ thin films can be essential in understanding the as yet-unknown structure of Al₂O₃ glass.”).

Id. at p. 18-19 of 32.

This reference relates to material formed by vapor deposition, rather than formed by cooling of material from a melted or liquid state. *Id.* at p. 19 of 32. While the materials are described as having amorphous phases, the existence of such phases does not, in and of itself, mean that the materials are glass. *Id.* at p. 19 of 32. In fact, a full reading of Lee supports Defendant's definition of “glass.” Lee states, “[t]he structure of pure Al₂O₃ glass, thus, has not been studied experimentally due to difficulties involved in its synthesis, particularly in quenching Al₂O₃ melts [Citation omitted]. As amorphous phases can be formed as thin films through vapor deposition [Citation omitted] study of amorphous Al₂O₃ thin films can be essential in understanding the as-yet-unknown structure of Al₂O₃ glass.” *Id.* at p. 19 of 32. Lee, page 099501-01. The abstract of the article also states, “[w]hereas prototypical Al₂O₃ is not a glass former, amorphous Al₂O₃ can be formed as thin films through vapor deposition and can serve as a structural model for the Al₂O₃ glass.” *Id.* at 19 of 32. Lee, page 099501-01. Thus, this article clearly states that vapor deposited amorphous alumina thin films may serve as a structural model for understanding alumina glass, but alumina glass has not yet been made by cooling melts to a solid, a process which is implied as the traditional understanding of glass making even in this paper. *Id.* at 19 of 32. Indeed, the authors produced an amorphous alumina structure in thin film form from vapor

deposition and yet do not consider it being a glass (only a structural model of a glass) because it had not been made by quenching a melt. *Id.* at p. 19 of 32.

DiamondOP's references regarding sintering are irrelevant to an understanding of "glass substrate." *Id.* at p. 19-20 of 32. For example, DiamondOP cites the following references:

Rice, R. W. *Ceramic Fabrication Technology*. New York: Marcel Dekker, 2003. ("liquid-phase sintering of oxides, especially Al₂O₃ via use of SiO₂-based glass phases (e.g., to produce commercial bodies of nominally, 85%, 90%, 94%, 96%, and 99% alumina), is most important. While Al₂O₃ can be sintered with SiO₂ (and other additives to form a glass phase at lower temperature) [1], industrial practice is to use natural minerals, mainly clays and talcs, as the sources of the desired in situ formed glasses. Although these glass-phase sources can present some issues, they are generally advantageous due to very low cost, ready glass formation.");

Mattox, D. M. *The Foundations of Vacuum Coating Technology*. Norwich, NY: Noyes Publications/William Andrew Pub., 2003. ("Sintering: To bond particles together by solid state diffusion to the contact points at an elevated temperature and sometimes under pressure. In many cases a small amount of bonding fluid may be present such as in glass-bonded 'sintered' alumina."). As another example, one of ordinary skill in the art would understand that that the most common glass used in semiconductors (SiO₂) as in insulator is formed by chemical vapor deposition, not by melting and quickly cooling.

Dkt. No. 50 at p. 27 of 34.

These articles discuss the presence of SiO₂ as a bonding material in sintered materials and that the SiO₂ may be present as a glass. Dkt. No. 43-3 at p. 20 of 32. However, such use of SiO₂ as a bonding material does not render the sintered material a glass. *Id.* at p. 20 of 32. As stated in the Mattox article, sintering is a process involving bonding by solid state diffusion – a process quite unlike the cooling of a liquid to form a non-crystalline solid. Such sintered Al₂O₃ materials are, in fact, crystalline. *Id.* at p. 20 of 32. The nature of a substrate as being a glass is defined based on the bulk characteristics of the substrate. Thus, as reflected in DiamondOP's contention as well as the Defendant's, the substrate must be non-crystalline, i.e., having an atomic-scale structure lacking long-range order. *Id.* at p. 20 of 32. Further, as would be understood by one of

ordinary skill in the art, the substrate must have the random structure of the liquid from which it is derived by cooling below the freezing point, without crystallization. *Id.* at p. 20 of 32. Accordingly, sintered Al_2O_3 materials, such as described in Rice, would not be glasses.

As to the extrinsic evidence added by Plaintiff on the day that the parties' Joint Claim Construction Statement, these were obviously mined to address what Plaintiff learned during the deposition of Vapor Tech. In that regard, the most recent additions mirror Plaintiff's attempt to capture multiple substrates, contra to the distinction made in the specification. For example, Plaintiff cites to:

Glass (Amorphous Solids), UC Davis ChemWiki at [http://chemwiki.ucdavis.edu/Core/Materials_Science/Insulators/Glass_\(Amorphous_Solids\)](http://chemwiki.ucdavis.edu/Core/Materials_Science/Insulators/Glass_(Amorphous_Solids)) ("Glass can be widely defined as an amorphous solid. An amorphous solid can be considered to have a random arrangement of atoms, such as observed in a gas, but more realistically can be considered to only lack long-range order such as those found in crystalline solids.")

Dkt. No. 50, p. 25 of 34.

This reference recognizes that "theoretically, any crystalline solid that can be brought to a liquid state, can be forced into an amorphous state through rapid solidification via extraordinary cooling rates..." Nonsilica glasses, in particular metallic glasses, can obtain unique electric, optical, or thermal properties from their crystalline counterparts through glassification. Nonmetallic glasses can obtain similarly unique properties by adjusting elemental compositions and introducing dopants." Dkt. No. 51-10 at p. 1 of 3.

Plaintiff also cites to:

U.S. Patent No. 6,696,157 at 3:33-43. ("As used herein, the term "diamond-like glass" (DLG) refers to substantially or completely amorphous glass including carbon and silicon, and optionally including one or more additional component selected from the group including hydrogen, nitrogen, oxygen, fluorine, sulfur, titanium, and copper. Other elements may be present in certain embodiments. The amorphous diamond-like glass films of this invention may contain clustering of

atoms to give it a short-range order but are essentially void of medium and long range ordering”)

Dkt. No. 50 at p. 25 of 34.

This reference is a patent directed to an invention, diamond like glass. It does not stand for the proposition that glass as defined in the intrinsic record of the ‘668 patent should be expanded to include substrates that are clearly and unambiguously distinguished from each other.

Plaintiff also cites to:

Talón, et al., PHYSICAL REVIEW B 66, 012201 (2002) (“structural glass (i.e., an amorphous solid”).

Id. at p. 25 of 34.

This article is directed to low temperature specific heat of amorphous, orientational glass, and crystal phases of ethanol. *Id.* at 52-2, p. 1 of 4. More particularly, the article is directed to the investigation of ethanol temperatures low enough as to investigate the region typically dominated in glasses by two level systems excitations or tunneling states. *Id.* at 52-2 p. 1 of 4. It was found that orientational glass (i.e., a disordered crystal), of ethanol exhibits the same linear term coefficient in the specific heat, and hence the same density of tunneling states, then the true, structural glass (i.e., an amorphous solid). *Id.* at 52-2 p. 1 of 4.

Plaintiff also cites to:

Brill, Robert H. “A Note on the Scientist’s Definition of Glass.” The Journal of Glass Studies vol. 4 (1962): 127-138. (“This state is characterized by a disordered molecular structure similar to that of liquids and a mechanical rigidity corresponding to that of crystalline materials.”)

Dkt. No. 50, p. 26 of 34.

This reference contains a theoretical discussion on glass in which it is noted, “theoretically, it should be possible to convert any liquid into a glass if it could be cooled rapidly enough to a sufficiently low temperature. In reality, however, it is only those liquids that are quite viscous at

their freezing points that go easily into the glassy state. As with so many other scientific phenomena this can be explained qualitatively in terms of the physical properties of the molecules involved.” Dkt. No. 52-6, p. 10 of 12. The reference also states “Equipped with an understanding of the nature of glasses and crystalline substances, it should be possible for us to classify intermediate materials into a few (hopefully) distinct categories by employing straightforward structural descriptions of the materials most often encountered.” *Id.* at p. 12 of 12.

Plaintiff also cites to:

2002 article by Yong-Taeg, et al. entitled “Fabrication of transparent silica glass by powder sintering”

Dkt. No. 50 p. 26 of 34.

This reference is directed to the fabrication by slip casting methods for high purity silica glass powder, where the starting material is a silica glass powder that is subjected to sintering atmosphere and sintering temperatures, resulting in transparent, sintered silica glass. Dkt. No. 52-8, p. 1 of 5.

Plaintiff also cites to:

E.M. Rabinovich, Preparation of glass by sintering, Journal of Materials Science 20 (1985), 4259-4297, at 4260. (“Sintering as a method of glass preparation is not a new concept.”)

Dkt. No. 50, p. 26-27 of 34.

This reference discusses a classification of sintering processes including sintering of premelted and pulverized glasses; sintering of premelted chemically treated glasses; sintering without melting; and sintering with melting. Dkt. No. 52-9, p. 1 of 39. The purpose of the review is to note that sintering techniques can be used to manufacture glass. *Id.* at 33 of 39. For example, the reference discusses sintering techniques applied to premelted glass powders. *Id.* at 33 of 39.

Plaintiff's position can, in sum, be described as an unabashed attempt to ignore the intrinsic evidence, in favor of pre and post-dated extrinsic evidence to support a position that is inherently flawed. Therefore, a person of ordinary skill in the art at the time of the invention of the '350 Patent would understand that the term "a glass substrate" in the context of the intrinsic evidence means "a glass substrate has the random structure of liquid from which is derived by cooling below the freezing (solidification) point, without crystallization."

D. "subplantation"

This claim term "the at least about 35% of sp³ bonds include subplanted carbon bonds" is found in asserted claims 1, 18, 30, 34, and 38 of the '350 Patent and the claim term "formed by subplantation" is found in asserted claim 18 of the '350 Patent. The terms are addressable in a single section below as the concept of subplantation permeates the disputed claim terms.

The '350 Patent uses "subplanted" and "subplantation" to cover the process of forming sp³ carbon-carbon bonds, as noted, for example, in the following paper cited within the '350 Patent: Lifshitz, Y., et al. "Subplantation Model for Film Growth from Hyperthermal Species: Application to Diamond." Physical Review Letters 62.11 (1989): 1290-1293. In particular, a person of ordinary skill in the art would understand from the context of the '350 Patent that the term "subplanted" and the term "subplantation" refers to the process described in the following passage from Lifshitz.

Subplantation, the suggested name for this process, is different from, but contains some features of both surface deposition and bulk implantation. Its uniqueness compared to the former is better film adhesion and the possibility of forming desirable structures at low temperatures, e.g., dense, metastable, epitaxial phases. [Citations omitted.] The advantages over the latter are shallow, narrow distribution profiles, sharp interfaces, minimal radiation damage, and crystalline films. Subplantation is a general phenomenon to which the proposed model can be applied for the formation of hard, crystalline films of different materials.

Dkt. No. 52-13, p. 4 of 4, Lifshitz, p. 1293.

The specification of the '350 Patent as well as the asserted claims clearly reflect that diamond-like carbon can generally be defined as a metastable, high density form of amorphous carbon. For example, the specification states:

In recent years, there has been considerable interest in the deposition of a group of materials referred to as diamond-like carbon. Diamond-like carbon can generally be defined as a metastable, high density form of amorphous carbon. Diamond-like carbon is valued for its high mechanical hardness, low friction, optical transparency, and chemical inertness.

Dkt. No. 50-4, p. 15 of 25, the '668 Patent, Col. 1, lines 18-23.

DiamondOP defines "subplanted" in terms of its use in claim 1 such that "the at least about 35% sp^3 carbon-carbon bonds include subplanted carbon bonds" means "the at least about 35% sp^3 carbon-carbon bonds include subplanted carbon bonds." Dkt. No. 43-3, p. 23 of 32. The term "the at least about 35% sp^3 carbon-carbon bonds include subplanted carbon bonds" does not make sense. There is no such thing as "subplanted carbon bonds." *Id.* p. 24 of 32. Subplantation according to the Lifshitz article identified in the '350 Patent is the process by which carbon is deposited so as to form sp^3 bonds. *Id.* p. 24 of 32. The subplanting of carbon atoms under the right circumstances produces a high density configuration which can result in sp^3 carbon-carbon bonds. *Id.* p. 24 of 32. Thus, sp^3 bonding is the result of subplanting carbon, not from "subplanting" the carbon bonds themselves. *Id.* p. 24 of 32. Said another way, it is the carbon that is subplanted, not the bonds. *Id.* p. 24 of 32.

DiamondOP defines "subplanted" in terms of its use in claim 18 as either plain and ordinary meaning, or "formed by a process that involves shallow implantation." The use by DiamondOP of the alternative definition for subplanted as meaning "shallow implantation" in claim 18 is not an accurate use of the term subplantation, as noted in the Lifshitz article cited in the '350 Patent. *Id.* p. 24 of 32. As stated in the Lifshitz article "subplantation ... is different

from but contains some features of both surface deposition and bulk implantation. Its uniqueness compared to the former is better film adhesion and the possibility of forming desirable structures at low temperature, e.g., dense, metastable, epitaxial phases.” *Id.* p. 24 of 32 (emphasis added). Lifshitz appears to have coined the term “subplantation” and clearly distinguishes it from surface deposition and bulk implantation. *Id.* p. 24 of 32. Subplantation is in fact the model through which sp^3 carbon-carbon bonds (which are one spectrum of the dense, metastable, epitaxial phase noted in Lifshitz) are formed through a specified process that cannot simply be defined as “shallow implantation.” *Id.* p. 24 of 32.

A person of ordinary skill in the art at the time of the invention of the ‘350 Patent would understand the term “the at least about 35% sp^3 bonds include subplanted carbon bonds” as meaning “the at least about 35% sp^3 carbon-carbon bonds are formed by subplantation” and the term “formed by subplantation” as meaning “formed by a process that is different from but contains some features of both surface deposition and bulk implantation, where desirable dense, metastable, sp^3 carbon-carbon bonds are formed at low temperature.”

E. “hydrogenated carbon”

The claim term “at least one of hydrogen and nitrogen” is found in asserted claims 1 and 21 of the ‘668 patent and the claim term “hydrogenated carbon” is found in asserted claims 13-14 and 19-20 of the ‘668 patent. The terms are addressable in a single section here as the purposeful introduction of hydrogen permeates both disputed claim terms.

As to the claim terms at issue, Plaintiff has misconstrued Defendants’ construction. “formulation” is not, as Plaintiff suggests, a “precise formulation.” The specification describes the introduction of hydrogen via a precursor gas. Plaintiff ignores the teachings in the specification on the introduction of hydrogen via a precursor gas in an attempt to capture the

well-known occurrence that, despite evacuation of a chamber of all atmospheric gases, water vapor binds to surface metals. Under Plaintiff's interpretation, a single hydrogen molecule resulting in a single C-H bond would fit its construction position. This is not what the specification describes, as the specific requirements and reasoning for introduction of hydrogen are clearly stated in the '668 patent:

SUMMARY OF THE INVENTION

The carbon protective coatings of the present invention will often be hydrogenated, generally providing a significantly higher percentage of carbon-carbon sp³ bonds than known hydrogenated amorphous diamond-like carbon coatings having similar compositions, and may optionally be nitrogenated.

Dkt. No. 50-4, p. 16 of 25, '668 Patent, Col. 3, lines 29-46 (emphasis added).

* * *

Work in connection with the present invention has shown that acetylene provides a highly advantageous source gas because of its relatively simple dissociation pattern. The plasma decomposition of a molecule can be described in terms of electron-molecule (primary) and ion-molecule (secondary) collisions, and their associated rate coefficients or their related appearance potentials. Advantageously, the dissociation of acetylene is dominated by its ionization at an appearance potential of 11.2 eV. Acetylene may be unique among the hydrocarbons in having such a well-defined reaction path.

The ionic composition of a plasma beam produced using an acetylene source gas produces a mass spectra at various plasma pressures which are dominated by the C₂ H₂⁺ ion and other hydrocarbon ions having two carbon atoms, collectively referred to as the C₂ species. The next most significant ions are the C₄ ions, which have been found to decrease in intensity as the pressure is lowered, being below 5% if the pressure is maintained below 5x10⁻⁵ mbar. For these reasons, carbon deposition using the plasma beam source and hybrid source of the present invention is preferably performed using a feed stock which comprises acetylene. Optionally, N₂, NF₃, or some other nitrogen feedstock may also be included to provide nitrogenated films.

Id. at p. 20 of 25, Col. 11, lines 9-32 (emphasis added)

* * *

EXPERIMENTAL

Films were deposited on aluminum substrates over a magnetic layer using opposed plasma beam sources and acetylene plasmas.

Id. at Col. 18, lines 12-14 (emphasis added).

* * *

The acetylene gas flow rate was pre-set (by an electronic controller) to promote diamond-like bonding in the ta-C:H carbon films, rather than optimizing the deposition rate. Gas flow rates are in standard cubic centimeters per second (scm). The matching-network circuit passive elements were pre-tuned so as to minimize the ratio of P_{ref}/P_{in} (power reflected over power input) at the above-mentioned acetylene flow rate.

Id. at Col. 18, lines 37-44 (emphasis added).

The introduction of hydrogen is part of the process for forming ta-C:H. It is the hydrogenated form of ta-C. It is not as Plaintiff suggests a byproduct of an H₂O remnant in the chamber.

A person of ordinary skill in the art at the time of the invention of the '668 Patent would, when looking at the claim language itself, understand the claim term "at least one of hydrogen and nitrogen" as meaning "at least one of hydrogen or nitrogen by formulation," the claim term "hydrogenated carbon" as meaning "carbon that is by formulation combined or treated with or exposed to hydrogen," and the claim term "the hydrogenated carbon includes more sp³ carbon-carbon bonds than carbon hydrogen bonds" as meaning "carbon that is by formulation combined or treated with or exposed to hydrogen and includes more sp³ carbon-carbon bonds than carbon-hydrogen bonds."

IV. CONCLUSION

For all of the reasons stated herein, Defendants respectfully request that this court adopt Defendants' construction positions on all disputed terms.

Date: May 31, 2016

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that on May 31, 2016, the foregoing document was filed electronically with the Court using the CM/ECF system, and will be served by operation of the Court's electronic system on all counsel of record.

By: /George D. Moustakas/
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